EASTERN CONNECTICUT STATE UNIVERSITY

It's All Very Taxing:
Interstate Tax Competition and the Balanced Budget

Senior Honors Thesis Proposal

by

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1   Introduction

In response to the potential loss of 600 jobs in Connecticut, last year, Governor Dannel Malloy forged a "once-in-a-generation opportunity," an agreement to provide $400 million in tax breaks to United Technologies, in exchange for the corporation to keep its headquarters in the state for fifteen years and to create 300 new jobs, among other conditions (Dowling & Gosselin 2014). Later in the same year, Nevada provided over $1 billion in tax breaks and incentives to Tesla Motors, to build a battery plant, promising upwards of 22,000 jobs, in the depressed city of Reno (Frank 2014). In Massachusetts, State Senator Eric Lesser is proposing a bill which would offer a 10 percent tax credit, up to $100,000 per year, on businesses that invest in Gateway Cities, "economically challenged cities with potential to anchor their regional economies" (Schoenberg 2015).

These situations are not unique. With the United States and world economies in the midst of recovering from one of the greatest financial catastrophes in recent memory, there have been many discussions over how to handle the most important issues facing individuals: unemployment and economic growth. Often times, state and local governments have attempted to provide tax abatements for individual businesses, some going as far as reducing their corporate tax rate for all businesses, to entice them to invest in their location, hoping they will either create jobs or sustain them.

However, because many states have been attempting to attract businesses from other states, tax competition is becoming a potent, albeit controversial policy tool. Because of the notion of corporate surplus, a byproduct of tax competition, where governments offer tax abatements larger than necessary to attract new businesses and retain those already existing, governments lose out on revenue from existing businesses (Cassell & Turner 2010). Research on tax competition in the United States and Switzerland has shown that reductions in the corporate tax rate does very little to attract businesses to or create jobs in a particular state (Fox & Luna 2002, Prillaman & Meier 2014, Rossi & Dafflon 2004). This, effectively, means that when state governments engage in tax competition, there is a potential for lost corporate tax revenue. To the contrary, Genschel (2002) argues that corporate taxes make up a small amount of tax revenue, so corporate tax competition should not make a huge dent in government income. Wilson and Wildasin (2001) argue that tax competition has its merits, because as taxes are lower in the short run, governments have less revenue available for "wasteful activities." The United States is in the midst of an economic recovery at the moment, though, and according to Larsen's (2013) report, there are still many state governments sitting on large piles of debt, which means that governments have less funding to operate their states, since in addition to providing services, they have to pay off their debt obligations.

Given that state governments are not supposed to accumulate deficits and are required to balance their budget every year; this paper will focus on how these governments attempt to create that balance in the age of tax competition. Econometric modeling will be used to demonstrate how corporate tax rates at the state level can affect future state government spending habits and the future composition of state government revenue sources. By using publicly available data, the research performed in this project will determine whether spending cuts or increased taxes on non-corporate sources is the dominating method that states use to balance their budgets.

2 Literature Review

Tax competition, given its prevalence, is a topic which has been researched extensively by economists, throughout the world, from Switzerland to the United States. This section will contain a discussion of existing literature on tax competition and its effects at the national, state, and local levels.

2.1 Tax Competition throughout the World

Wilson and Wildasin (2001) provide an evaluation of the literature available at the time on tax competition, discussing the effects of tax competition on society, both positive and negative. They find that tax competition has its benefits because it can encourage governments to become more efficient, because they have to close the budget deficit when tax revenue is lost. Further, they argue that governments which reduce tax rates on all businesses, instead of offering tax abatements to certain ones, help improve welfare, because these abatements are inherently inefficient, because two companies of the same size may be paying two different tax rates. The authors also find that tax competition only modestly reduces the welfare of residents, in addition to modestly reducing the amount of tax revenue received by governments. Worth questioning, however, is why there is such a modest decline in tax revenue and welfare. Could it be due to governments increasing tax rates that were not cut due to tax competition?

Genschel (2002) continues this discussion and provides a wealth of information on tax competition throughout the world, specifically focusing on how it can affect government services. He argues that while companies want low taxes, they also want access to high quality public goods, as well as a highly-educated workforce, which generally requires a fairly large government. As a result, corporate taxes are just one of many factors that can draw a business to a particular jurisdiction, especially since they can use creative accounting methods to find ways around high taxes. However, Genschel points out that corporate taxes make up only a small portion of government revenue, meaning that governments engaging in tax competition need not worry about reducing the quality of services they provide due to low tax revenues, even when new businesses may not be coming in. Instead, he argues that capital gains taxes are a more lucrative source of income, and are even more vulnerable than corporate taxes, due to the mobility of financial assets.

Genschel mentions in his paper, however, that governments may decide to increase taxes when dealing with tax competition, particularly when businesses leave high-tax jurisdictions for those with lower taxes, "in order to maintain the same revenue from an eroding tax base." This has led to some interesting implications in the United States, which will be discussed in the next section.

2.2 Tax Competition on the Large Scale: The United States

Chirinko and Wilson (2011) pose the question, does tax competition, at the state level, in the United States lead to a race to the bottom or is it like "riding on a seesaw"? In their empirical model, based on data from 1965 to 2006, they find that when one state increases its corporate tax rate, then surrounding states will respond by decreasing their taxes, to attract discouraged business owners. Further, they present an interesting finding, that tax competition may not necessarily be the primary cause of the overall downward trend in state corporate taxation in the United States. Instead, the researchers find that aggregate shocks, affecting the whole country, have been the main driver of this downward trend. This is an important issue to consider, because it challenges the commonly held notion by politicians that their states must be driving

businesses away. The researchers argue that, instead, negative firm entry may not be caused by individual states' economic policies, but generally poor economic conditions, affecting the country as a whole. In addition, Chirinko and Wilson (2011) find that surrounding states do not concern themselves so much with corporate tax rates, they tend to focus on investment tax credits, as they work to attract more mobile capital sources.

Felix's (2009) paper on the relationship between corporate taxation and wages presents some interesting findings which could prove useful for this project. The author finds that when a state increases its corporate tax rate, then capital will leave the state, in search of lower taxes, predicted by Chirinko and Wilson (2011). This means that workers in the home state are less productive, with less capital, which, essentially, gives their employers reason to reduce their wages. This finding is demonstrated using an econometric model which considers characteristics of employees, characteristics of individual states, state corporate taxes, state income taxes, and sales taxes. An interesting, additional finding by Felix is the more dramatic impact of increased corporate taxes on the reduction of wages after 1991, which she attributes to increased global competition.

Fox and Luna (2002) examine how corporate tax rates have been adjusted at the state level from 1960 to 2000. Their research specifically focuses on the impacts of legislation that affected both federal and state corporate taxes, including the Economic Recovery Tax Act of 1981 and the Tax Reform Act of 1986, which is known for reducing the federal corporate tax rate in the United States from 46 percent to 34 percent. They also discuss the possibility that tax evasion and tax sheltering may be playing a role in state corporate tax revenue declination. Most importantly, however, is that they discovered that states may be losing tax revenue due to tax competition and the granting of tax abatements. Further, Fox and Luna mention that when these firms, which were meant to be attracted through the tax abatements, come to a state, they need to use that state's government services, and in these cases, the firms are not paying for them. This means that the tax burden is shifted to individuals, otherwise the government will have to cut the budget. It is up to politicians to decide which option is the lesser of the two evils.

Prillaman and Meier's (2014) research is most closely related to the research which will be done for this project. In their paper, econometric modeling is used to determine the impacts of business-friendly tax policy on state economies. They find that "the empirical effect of business tax policy on economic development clearly diverges from economic theory," which predicts that firms should always move to the state with the lowest taxes (Prillaman & Meier 2014). While the authors found that firms are less likely to leave a state in the event of a tax cut, they also discovered that these types of tax cuts generally have no impact on economic conditions in a state, if anything, they may result in worse economic conditions. An issue to consider is firms' willingness to move to different states, some firms which have made large investments in a region, like the case of Tesla in the introduction of this proposal, may be less likely to move than firms with more mobility. This idea will be described in more detail in Section 3.3.

With respect to Prillaman and Meier's models, they used multiple models to determine the impacts that state corporate taxes, as a share of gross state product (GSP), on multiple economic factors at the state level, factors that are generally considered to be keys to economic growth. These include GSP growth rate,

change in the employment rate, growth rate of per capita personal income, change in the net job creation rate, change in the poverty rate, and changes in the entry and exit rates of firms.

2.3   Tax Competition on the Small Scale: Ohio and Switzerland

Chirinko and Wilson's (2011) findings about the behavior of tax competition in the United States, as a whole, are dramatically different from the findings of others on tax competition on a smaller scale. Cassell and Turner (2010), Rossi and Dafflon (2004), and Feld, Kirchgassner, and Schaltegger (2010) found that in Ohio and Switzerland, tax competition behaved more like the traditional race to the bottom.

Cassell and Turner (2010) consider the impacts of investment tax credits on intermunicipal tax competition in Ohio. Their research entails a discussion of how tax competition has had a tendency to shift the power of bargaining in municipalities from governments to firms, especially in the cases of economically depressed communities and times of general economic hardship. This leads to what they describe as "corporate surplus," where this shift of power causes governments to feel compelled to offer inefficiently large tax abatements to businesses, which also becomes a bigger issue when increasingly many municipalities in the state are willing to offer such abatements. The researchers mention,

> While the justification to expand the enterprise zone program [which introduced intermunicipal tax competition in Ohio] was to increase Ohio's competitiveness, its primary impact has been to affect the internal distribution of firms within the state. (Cassell & Turner 2010)

More specifically, their results show that, between 1983 and 2004, only two percent of abatements were granted to firms that relocated from outside the state, the remainder being firms that either expanded within the state or moved to a different municipality.

In their paper, Rossi and Dafflon (2004) explore the effects of tax competition in Switzerland on its cantonal, i.e. provincial, and local governments. Given the nation's size, about half that of Maine, Swiss firms have even more mobility between cantons than American firms have between states in the United States. They observe, consistent with other research on tax competition, that it can lead to three major problems: fiscal imbalances in the current budget, shifts in the tax burden to make up for the lost revenue as a result of tax competition, and the reduction of expenditures on public goods, such as roads and schools. The other issue that results, from the perspective of competitive cantonal governments, is the constant need to reduce the corporate tax rate, because there is an evident race to the bottom in corporate taxation in Switzerland. The researchers state,

> Tax incentives cannot attract firms to a specific location eventually, because the ongoing process of tax competition removes any comparative advantages subnational governments might have one over the other in the short run by implementing such a downgrading policy. (Rossi & Dafflon 2004)

In addition, they discuss the notion that tax competition creates inefficiencies in the tax system, and create inequality amongst corporate taxpayers, because it creates a bias between taxpayers who are and are not "privileged" (Rossi & Dafflon 2004).

More recent research by Feld et al. (2010) studies the impacts of fiscal federalism, that is, the ability of local governments to make fiscal policy, on the size of cantonal governments in Switzerland. In their paper, Feld et al. find that tax competition has a statistically significant effect on cantonal government revenues, and had the most significant impact among their hypotheses. This is based on the different hypotheses of fiscal federalism and taxation they tested, the degree of fragmentation, tax competition, and tax exporting, to see which one had the greatest impact on the size of government. More specifically, they discovered, through their econometric model, that when the intensity of tax competition is less, i.e. when the corporate tax rate of competitive cantonal governments is higher, there is less competitive pressure, meaning that cantons do not feel compelled to reduce their tax rates to attract businesses.

2.4   The Role of this Project

The purpose of this project is to provide an empirical analysis of how state governments attempt to maintain a budget balance, while they are engaging in tax competition. There will be a particular concentration on which part of the budget balance is affected more by tax competition, do state governments try to gain back the lost revenue from other sources or do they opt to cut back on government spending?

This paper will be written in the context of an economic recovery, after what many consider to be the worst financial crisis since the Great Depression. There has been little attention paid to state governments and their budget crises during this time period, which is concerning, since they are responsible for funding many aspects of people's daily lives, from highways to Medicaid.

In addition, this project is expected to make a very important connection between the behavior of tax competition between smaller and larger governments. Chirinko and Wilson (2011) found that when a state in the United States learned of one of its neighbors increasing its taxes, the home state would reduce their taxes in response. In Switzerland, Feld et al. (2010) and Rossi and Dafflon (2004) have found that cantons all reduce their taxes, acting as a race to the bottom. Similar results have been found in Ohio and its intermunicipal tax competition (Cassell & Turner 2010). By using location theory, this paper should be able to explain why tax competition behaves like a race to the bottom in Ohio and Switzerland, while "riding on a seesaw" in the United States as a whole.

Further, this paper should open doors to further research on how states have been affected by the recession, and hopefully will start discussions on how politicians can help make their states competitive, leading them to maintain or improve the quality of life in their jurisdictions.

3 Methods

3.1 Supply Side Economics and the Laffer Curve

Providing firms with tax incentives is certainly nothing new. Dating back to the post-World War I era, the late 1910s, the notion of cutting taxes on businesses has been a vehemently debated issue in the United States (Wanniski 1978). Supply-side economics is the basis of justifications for cutting taxes, and it is clearly a very comprehensive topic. For this project, one of the most significant products of supply-side economics, the Laffer curve, will play a significant role. The Laffer curve is often cited as the basis of former President Reagan's tax policy, and it seems to have an influence in shaping the tax policy of states which are trying to pose themselves as being "business-friendly" today.

The Laffer curve is a relatively simple economic model, illustrated in Figure 1. It theorizes that as the tax rate increases, government revenue will increase with it, until a certain point. Once it reaches that point, then the government will start to lose revenue as it increases the tax rate. In other words, the Laffer curve is quadratic, as demonstrated by its functional form, in (1), where G represents government receipts, t represents the tax rate, p represents the price of products, and Q is the quantity produced, therefore pQ represents gross state product (Blinder 1981). This curve can be taken to an extreme: when the tax rate is zero percent, the government receives no revenue, for obvious reasons, and when the tax rate is one hundred percent, the government receives no revenue, because nobody wants to work when the government is taking all their earnings away (Wanniski 1978). In the real world, however, people will not be comfortable without the government, so the zero percent extreme is non-existent. Pure communism would certainly allow for a government with a one hundred percent tax rate, but that is an extremely rare case, and is not something that would apply to supply-side economist's world, given its roots in Adam Smith's classical view. As a result, the middle of the Laffer curve must be considered for all practical purposes.
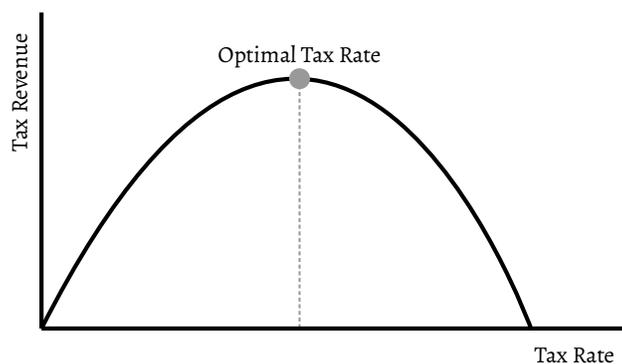
$$G = pQf(t) \tag{1}$$

Figure 1: The Laffer curve, an economic model depicting the relationship between tax revenues and tax rates. Note the optimal tax level, which is at the maximum level of tax revenue collected by the government (Wanniski 1978).

The Laffer curve demonstrates that there is a particular tax rate at which the government can maximize its revenues. Once taxes are at that level, if rates are reduced, production will theoretically increase, because one of the costs, taxation, has been reduced. However, even if production does increase, it would not be enough to offset the loss in tax revenues due to the lowered tax rate. If taxes increased at this level, then production and tax revenue will both decrease, meaning that tax rates are inefficiently high. Given this inefficiency, anything past the Laffer curve's optimal tax rate is considered the prohibitive range for government by supply-side economists (Wanniski 1978).

From the function that describes the Laffer curve, we can find the government's optimal tax rate, where $\frac{dG}{dt} = 0$. $\frac{dG}{dt}$, assuming the functional form provided by Blinder (1981), is given by (2). The first term, pQ, which represents total production, and would be a solid estimate of marginal tax yield, assuming no behavioral responses, is expected to have a positive effect. The second term, $tp\frac{dQ}{dt}$, which represents the change of production with respect to the change in tax rate, is expected to have a negative effect. The third and final term, $tQ\frac{dp}{dt}$, which represents the change in price with respect to the change in tax rate, is expected to have a positive effect (Blinder 1981).

$$\frac{dG}{dt} = pQ + tp\frac{dQ}{dt} + tQ\frac{dp}{dt} \tag{2}$$

However, there is a flaw in Blinder's (1981) model of the Laffer curve. He uses tpQ, which is a linear function, not quadratic. For the purposes of this project and its empirical analysis, Blinder's model will be modified slightly to make a quadratic representation of the curve, shown in (3), its derivative is given in (4). The signs on the three terms of (4) are expected to be the same as those in (2).

$$G = pQ(t^2 + t) \tag{3}$$

$$\frac{dG}{dt} = (2t + 1)pQ + (t^2 + t)p\frac{dQ}{dt} + (t^2 + t)Q\frac{dp}{dt} \tag{4}$$

Because there is an expectation that $(t^2 + t)p\frac{dQ}{dt}$ will have a negative sign, and because the government's optimal tax rate is $\frac{dG}{dt} = 0$, it is inferred that, in (4), the government's inefficiently high tax rate can be shown by (5). This function is the epitome of the Laffer curve, because it explains that when taxes are at a level that is inefficiently high, where the left side of (5) is less than the right side of (5), the change in production will not be significant enough to justify change in marginal tax revenue. In fact, when the tax rate is inefficiently high, there will be a decrease in total tax revenue, based on this theory.

$$(t^2 + t)p\frac{dQ}{dt} < (2t + 1)pQ + (t^2 + t)Q\frac{dp}{dt} \tag{5}$$

3.2 Government Spending and the Keynesian Model

One of the most passionate debates in the United States is over the size of government. This year, in Connecticut, Governor Malloy proposed a budget that has been highly controversial, making cuts in departments which many residents consider to be vital to the state, from education to mental health. Meanwhile, state residents and businesses have been arguing that they pay too much in taxes, so it is the government's job to

become more efficient, even if it means making sacrifices (Kauffman & Keating 2015). These contrasting views provide a glimpse into the commotion behind discussions on government spending.

If firms are not enticed to relocate by lowered tax rates in states outside of their home, then in response to the expected loss of corporate tax revenues, state governments are likely to make cuts to their budgets to create the required balanced budget. Government budgets are very complex, with many different aspects of the economy, from employment to economic growth, affecting their balance and composition. Plenty of theories have been developed to explain how governments should balance their budgets, in good times and bad. This project will be focused on how states have been attempting to balance their budgets, while dealing with, and sometimes engaging in, tax competition and the recovery from the Great Recession.

One particularly enticing and influential model of government spending is the one developed by John Maynard Keynes. This model is well-known for encouraging governments to increase their spending during recessions, providing either unemployment insurance or temporary work, because then the people will put that money back into the economy (Rosen 2002). This provides a contrasting view to the Laffer curve, by hitting the demand side of the economy, saying that when governments assist consumers, as opposed to producers, the economy will more readily correct itself. Further, there is an assumption in Keynesian theory that once the economy is stimulated, the private sector will start hiring once again, removing the need for the jobs the government created, and reducing the need for governments to provide substantial amounts of unemployment insurance.

As with any model that attempts to affect the behavior of government during poor economic times, Keynes's model has its criticisms. Of particular note is the concern that government bureaucracy and lawmaking can make stimulus programs take years to implement, much less be influential (Rosen 2002). To correct for this issue, the models used in this paper will lag the independent variables by two years, to account for the potential hurdles that are introduced by the political process.

An issue with Keynesian theory being applied to the state level is the problem of deficit spending. State governments have more difficulty than the federal government during recessions, because they cannot incur deficits in their budget. According to a report published by the National Conference of State Legislatures (2010), every state, with the exception of four, has a balanced budget requirement, which is enforced by either constitutional or statutory law. This means that states can only issue bonds, as a last resort, when their budgets cannot be balanced, a particularly pressing issue during economic downturns, especially if Keynesian theory holds. These bonds, also, cannot be used to fund a state's daily operations, such as its employees and retirement funds; instead they must be used for capital expenditures, such as roads and hospitals. Despite this, however, during recessions, interest rates tend to fall, meaning that borrowing, from the government's perspective, is cheaper (Cecchetti & Schoenholtz 2011).

The Ricardian equivalence will play a role in the models, particularly those concerning government spending, used in this paper. This paper will assume, perhaps controversially, that, in the long run, state governments spend every dollar that they take in. In other words, during an economic expansion, the governments should take in more than they spend, and during a recession, governments will spend more than they take in, either from their savings or through debt (Seater 1993). This means, for the purposes of

analysis, the effects of tax rates on government revenue, described in section 3.1, should be the same as the effects of tax rates on government expenditures.

3.3   Location Theory and Firm Choice

As demonstrated by the literature review, corporate taxes have the potential to have an impact on firms' location choices, justifying tax competition. However, in addition to empirical research, location theory can demonstrate that the decision of where to locate, from the firm's perspective, has to do with much more than taxation. The Salop Model of Location Theory implies that when states are larger and further away from each other, then interstate tax competition becomes a less significant issue for them. This model also implies that when neighboring states do not have any largely populated areas near the border, tax competition has less of an impact (Salop 1979).

  This means that, for example, Connecticut and Massachusetts are more likely to engage in tax competition than Montana and Idaho. Building on this example, it can be assumed that if a firm decides to move to Missoula, Montana from Boise, Idaho, almost 400 miles apart, the firm incurs a larger cost from the move than if it was moving from Hartford, Connecticut to Springfield, Massachusetts, 25 miles apart. These costs can be anything from finding new labor, because workers are not necessarily mobile and there is no guarantee that the new cities' workers will have the appropriate skills, to developing a new customer base, especially when the firm has established and loyal customers. This relationship between taxation, relocation costs, and the influence of a state is explained by (6) below, where v represents the highest tax rate a firm is willing to pay, p represents the current tax rate of a state, c represents relocation costs, which determine $\hat{x}$, the influence of the state (Salop 1979). This function will be incorporated into the tax competition variable used in the models of this project.

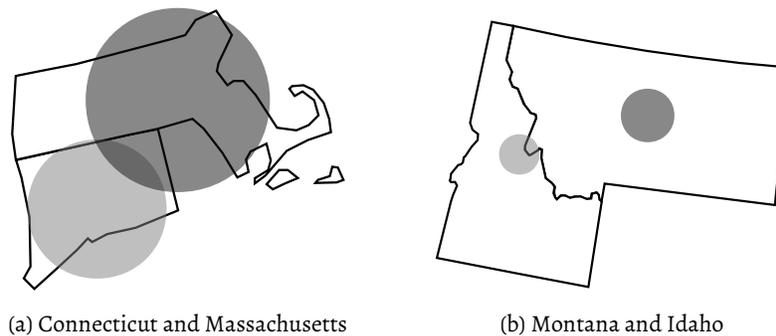(a) Connecticut and Massachusetts   (b) Montana and Idaho

Figure 2: Salop's circle model implies that when two states are engaging in tax competition, they will have a certain circle of influence, determined by v, p, and c. Two circles of the same radius affect small states and large states differently.

$$\hat{x} = \frac{v - p}{c} \tag{6}$$

  What is learned from Salop's model, Figure 2, and (6) is that firms that are located closer to borders should be more susceptible to give in to tax competition, because the home state's circle of influence may enter that of a neighboring state. In Figure 2, it is shown that Massachusetts and Connecticut, being small

states, have large circle of influence, with both states' circles entering the other, to encourage firms to move to their states. In Montana and Idaho, on the other hand, circles of influence of the same radius covers very small areas of those states, with Idaho's circle touching a very small portion of Montana. It can also be said that cities built on the border of another state can introduce tax competition. This can apply to situations like Pennsylvania and Delaware, where firms based in Philadelphia can easily incorporate in Wilmington, only 30 miles away, to take advantage of Delaware's lower tax rates and its well-regarded corporate law (Roe 2009).

The literature reviewed does not consider the impacts of tax competition in this way. Chirinko and Wilson (2011) discuss the impacts of tax competition throughout the United States, and while they do account for the "relatedness" of states, they do not consider how tax competition may affect regions with smaller states, such as the northeast, compared to regions with larger states, such as the west. This is particularly interesting, because their results led to the conclusion of interstate tax competition in the United States acting more like a seesaw, where states are more likely to reduce taxes when their neighbor increases taxes, than a race to the bottom. This differs from the behavior of tax competition within the state of Ohio, where it was a race to the bottom (Cassell & Turner 2010).

Cassell and Turner mention that the intermunicipal tax competition in Ohio was designed to make the state as a whole more competitive, but they found that, between 1983 and 2004, only two percent of firms which received municipal tax abatements were from out of state. Could this be because firms in neighboring states, such as Pennsylvania and Indiana, did not have an incentive to move to Ohio? How did these states' tax policy differ from Ohio's over time? Using location theory, it could be said that the intermunicipal tax competition in Ohio existed and worked because of the small size of municipalities, compared to the relatively large size of states. Further, an argument could be made for the relatedness of municipalities within a state compared to the relatedness of states. There could be drastic differences between Cleveland and Erie, ranging from regulations to taxes at the state, county, and municipal level to changes in corporate law, but the differences between Cleveland and Toledo could be less substantial.

3.4   Proposed Empirical Models

Econometric modeling will be used in this paper, to measure the impact that tax competition has had on state governments. Three similar, but different, models will be used to measure the resultant changes in state government spending levels and the changes in the composition of state government revenue sources. The proposed models are represented by (7), (8), and (9) below. The variables that will be studied in these models, and a summary of their expected impacts, are described in Table 1, with explanations of these effects in each model's respective section (3.4.1, 3.4.2, and 3.4.3). Consistent with the methods presented in other models, and to address a potential fault in Keynesian economic theory, the data will be lagged by two years, to account for delays in the political process (Chirinko & Wilson 2011, Feld et al. 2010, Fox & Luna 2002, Prillaman & Meier 2014). This means, for example, when measuring the effects of the corporate tax rate on government spending in 2013, the corporate tax rate in 2011 would be an estimator.

Table 1: Definitions of variables in models to be used in this project, with expected impacts of independent variables on dependent variables.

Name	Variable	(7)	(8)	(9)
CORPREV	Corporate tax revenue per capita			
GOVEXP	Government expenditures per capita			
INCREV	Personal income tax revenue as percentage of total revenue			
CORPTAX	Nominal corporate tax rate (linear term)	+	+	-
CORPTAX²	Nominal corporate tax rate (quadratic term)	-	-	+
INCTAX	Nominal income tax rate (linear term)	+	-	+
INCTAX²	Nominal income tax rate (quadratic term)	N/A	+	-
EMP	Employment rate	+	+	+
GSP	Gross state product per capita	+	+	+
EDU	Percentage of state residents with at least a college degree	+	+	+
ENTRY	Ratio of firm entry to firm exit	+	+	-
INF	Influence of home state ($\hat{x}$ from Section 3.3)	+	+	+
FEDSUB	Federal subsidy received by state per capita	N/A	+	N/A
INT	Interest rate on US Treasury bonds	N/A	-	N/A

3.4.1 Model for Corporate Tax Revenue

$$CORPREV = \alpha + \beta_1 CORPTAX + \beta_2 CORPTAX^2 + \beta_3 INCTAX + \beta_4 EMP + \beta_5 GSP + \beta_6 EDU$$
$$+\beta_7 ENTRY(CORPTAX, INF, EDU) + \epsilon \tag{7}$$

The first model for this project, (7), will be used to determine how corporate tax rates affect corporate tax revenue, as a whole. Based on the Laffer curve, the sign of the linear term of the corporate tax rate, *CORPTAX* is expected to be positive, while the quadratic term of the curve, *CORPTAX²*, is expected to be negative.

The effects of the income tax rate, *INCTAX*, on corporate tax revenues are mostly due to possible changes in population. If the income tax rate goes down, it is expected that more individuals would be tempted to move to the state, meaning that there should be more productivity in the state, increasing corporate revenues, which means increased corporate tax revenue. This means that there is an expected positive relationship between *INCTAX* and *CORPREV*.

In terms of employment, which is represented by *EMP*, it is safe to assume that with more employed people, there is more productivity in the state. As a result, there is an expected positive relationship between *CORPREV* and *EMP*.

Gross state product will, clearly, have an impact on a state's government revenues. If the GSP is growing, then state governments are expected to receive more tax revenues, as a result, there is an expected positive relationship between *GSP* and tax revenue, both individual and corporate.

Another factor that should be considered is the education level of residents in a state. More educated workers tend to be more productive, providing more to firms, hence why they are paid more than less educated workers. Therefore, it will be expected that there is a positive relationship between *EDU*, the

percentage of state residents with at least a Bachelor's degree, and tax revenues, both corporate and personal income.

Entry and exit rates are key to this project. One of the reasons that lawmakers lower corporate tax rates is to entice new firms to come to their states. For the purposes of this project, the net entry rates, i.e. total firm entry minus total firm exit, will be analyzed for each state. When entry rates increase, there is an expectation that there is more production, and therefore more to be taxed. Further, with more entry, there will be more labor demand, and therefore, there will be more taxable personal income. As a result, there should be a positive relationship between corporate tax revenue, as well as personal income tax revenue, and *ENTRY*.

An important note must be made for the *ENTRY* term. The reader should note that *ENTRY* is represented in the models, (7), (8), and (9) by *ENTRY(CORPTAX, INF, EDU)*. A two-staged least squares regression will be performed in this project, because this will provide information regarding the factors that bring new firms to the state. Firm entry is affected by several variables, one of the most significant being the perceived "business-friendliness" of the state. The state's corporate tax rate, location influence (Section 3.3), and education level have been chosen as potential independent variables in determining firm entry and exit rates. To properly account for these effects, a two-staged least squares regression is imperative to this analysis.

The choice of *CORPTAX* as one of the variables in the *ENTRY* term comes from attempting to measure the indirect effects of the corporate tax rate, caused by firm relocation. *INF*, which comes from $\hat{x}$ in Section 3.3, measures how much theoretical influence a state should have, when it comes to affecting firm entry.

3.4.2 Model for Government Expenditures

$$GOVEXP = \alpha + \beta_1 CORPTAX + \beta_2 CORPTAX^2 + \beta_3 INCTAX + \beta_4 INCTAX^2 + \beta_5 EMP + \beta_6 GSP$$
$$+\beta_7 FEDSUB + \beta_8 INT + \beta_9 ENTRY(CORPTAX, INF, EDU) + \epsilon \tag{8}$$

This model, (8), will determine how government expenditures are affected by changes in the corporate tax rate. By applying the Ricardian equivalence to the Laffer curve, the direct effects of the corporate tax rate's linear and quadratic terms, *CORPTAX* and *CORPTAX²*, on government expenditures should be the same as those in (7). The same will be said about *INCTAX, INCTAX²*, and their signs, because individuals are expected to make up the difference between total government revenues and corporate tax revenues.

Gross state product growth should affect government expenditures in a welfare-maximizing government. As discussed in Section 3.2, governments are expected to spend more than they take in during recessions, and are expected to spend less than they take in during economic expansions. As a result, government expenditures are expected to decrease as *GSP* increases.

As employment increases, the government can count on increasing tax revenue, from individual and corporate sources, so it can spend more money to improve government services, whether it's fixing bridges or providing grants to students. As a result, it is expected that there is a positive relationship between *EMP* and *GOVEXP*.

An interesting feature of state government budgets is the federal government subsidy. This subsidy allows the federal government to assist states in their attempts to provide all their services. If this subsidy

is reduced, then state governments will have to make cuts to their budget, especially if they have a large dependence on the subsidy. To clarify this, consider that, in 2008, Illinois and Louisiana both received about $14 billion in federal subsidies, but Illinois has almost three times the population (United States Census Bureau 2015). Because states are reliant on the federal subsidy, there will be an expected positive relationship between *FEDSUB*, which represents the size of the subsidy per capita, and government expenditures.

While state governments are not allowed to have a deficit in their budgets, the interest rate could affect state government expenditures. A high interest rate discourages anybody from borrowing, so if it is high, governments at all levels are less likely to invest in long-term projects, the one time when governments are, more or less, allowed to borrow, by issuing bonds. As a result, the relationship between government expenditures and *INT*, the interest rate on 10-year U.S. Treasury bonds, is expected to be negative.

Firm entry and exit are fundamental to determining government expenditures in this analysis. There is an expectation that when more firms enter a state, the state will receive more tax revenue, and therefore, based on the Ricardian equivalence described in Section 3.2, will be inclined to spend that additional revenue. This leads to an expected positive relationship between *ENTRY* and *GOVEXP*.

3.4.3 Model for the Balanced Budget

$$INCREV = \alpha + \beta_1 CORPTAX + \beta_2 CORPTAX^2 + \beta_3 INCTAX + \beta_4 INCTAX^2 + \beta_5 EMP + \beta_6 GSP + \beta_7 EDU$$
$$+ \beta_8 ENTRY(CORPTAX, INF, EDU) + \epsilon$$

$$(9)$$

Fundamental to this analysis is the measurement of how the state's government can balance its budget. For this project, the composition of state revenue sources will be considered. (9) will be used to estimate the percentage of the state budget that is made up of income tax revenues. This measure was chosen to determine whether individuals paid the price of increased taxes or reduced government expenditures when their state is engaging in tax competition.

The first two variables, *CORPTAX* and *CORPTAX*^{2}, from the Laffer curve's analysis of corporate tax revenues, are expected to affect this model in the opposite way that they affected (7), because when corporate tax rates increase, individuals are likely to pay the costs of lost corporate tax revenue.

Individual income tax rates are assumed to have the Laffer curve effect, as well, and *INCTAX* and *INCTAX*^{2} are expected to behave the same way in (9) as *CORPTAX* and *CORPTAX*^{2} behave in (7). In other words, *INCTAX* should have a positive impact on *INCREV*, while *INCTAX*^{2} should have a negative impact on *INCREV*.

With more employment comes more productivity in a state. As more residents of a state are working, there is an expectation that there will be a larger contribution to the state government's tax revenues. As a result, there is an expected positive relationship between *EMP* and *INCREV*. Likewise, with a higher *GSP*, there is more personal income being earned, so individuals will continue to contribute more to state budget revenues, meaning that there is a positive relationship between *GSP* and *INCREV*. In addition, the education level of individuals in a state, *EDU*, can have a positive impact on *INCREV* because, generally speaking, more educated workers are considered more productive, and tend to be compensated for it.

Last, but certainly not least, is the relationship between *ENTRY* and *INCREV*. A key assumption of this project is that when there are more firms in a state, then corporate tax revenues will make up a larger

share of total revenues in the state budget. This means that the government will not be as dependent on non-corporate sources for funding itself, so there is an expected negative relationship between *ENTRY* and *INCREV*.

3.5   Data Collection and Analysis

For this project, data will be collected from the continental states' budgets, dating back to 1976, which will be sufficient to create a reliable model. However, over 1,700 state budgets will need to be examined, which will be very time consuming. The United States Census Bureau, however, has a report called the "Annual Survey of State Government Finances," a comprehensive report on state budgets, which is viewable online, with reports going back as far as 1992. In response to a request to the Census Bureau, the researcher has obtained prior reports, going back to 1951. Data on firm entry and exit will be obtained from the United States Small Business Administration, whose Statistics of U.S. Businesses program has data going back to 1995. A request has been submitted to the Small Business Administration for data back to the 1970s. There is currently an ongoing search for information about state corporate tax rates and investment tax credits, to prevent the reading of hundreds of state budgets unnecessarily.

Further, data necessary for this model that cannot be collected from the aforementioned sources will be retrieved from the Bureau of Labor Statistics, which has state-level data on unemployment, dating back to 1976. Data will also be collected from the Bureau of Economic Analysis, which has yearly state-level data on incomes and GSP growth. The Federal Reserve has historical data on interest rates on U.S. Treasury bonds, as far back as 1962, which is sufficient for this project.

The statistical software package Stata will be used to perform the regressions required by (7), (8), and (9). This software also has the ability to perform two-staged least squares regression, required by *ENTRY*(*CORPTAX*).

3.6   Expected Results

One of the key predictions of this project is that small states, as well as states that have cities on their borders, will be more susceptible to tax competition than others. In other words, states which have a circle of influence, as described in Section 3.3, that enters another state, have a greater potential impact from tax competition.

It is more difficult to predict the main result of this project, determining how states balance their budgets in response to tax competition, particularly when this competition fails to attract businesses. As discussed in Section 2.1, increasing taxes, i.e. shifting the responsibility of lowered tax revenues to non-corporate tax sources, is certainly a politically unpopular move. Further, it is fairly well known that a cut in government services can be politically unpopular, even if it is done in the name of making making government more efficient.

Regardless, lawmakers would likely have an easier time justifying cuts in spending, as opposed to increasing taxes, because they can do it in the name of efficiency. For this project, the researcher expects that state governments will be more likely to cut spending on government programs, than to increase taxes, to make up for the loss in revenue from tax competition.

This can introduce several problems, however. As shown in Section 3.2, everybody wants their program to be fully funded. Students want more funding for their universities, the impoverished want more funding for Medicaid, commuters want more funding for highway and public transit improvements; the list goes on. Another issue arises from Section 3.2, if tax competition is an issue during economic downturns, how do these governments fund programs that help the unemployed? If the state wants to fix bridges, a program that could put thousands of people to work, how will it pay for the program? While states can issue bonds to pay for the project, they would have to allocate funds to pay back the interest over time, an imperative consideration for states when they are trying to cut spending.

4   References

Blinder, A.S. (May 1981). "Thoughts on the Laffer Curve." *Federal Reserve Bank of St. Louis Review.* Retrieved from http://research.stlouisfed.org/publications/review/article/2808.

Cassell, M.K. & Turner, R.C. (December 2010). "Racing to the Bottom? The Impact of Intrastate Competition on Tax Abatement Generosity in Ohio." *State and Local Government Review,* 42. Retrieved from http://0-www.jstor.org.www.consuls.org/stable/41057629.

Cecchetti, S.G. & Schoenholtz, K.M. (2011). *Money, Banking, and Financial Markets, Third Edition.* New York, New York: McGraw-Hill/Irwin.

Chirinko, R.S. & Wilson, D.J. (2011). "Tax competition among U.S. states: Racing to the bottom or riding on a seesaw?" *CESifo Working Paper: Public Finance,* 3535. Retrieved from http://hdl.handle.net/10419/49466.

Dowling, B. & Gosselin, K.R. (February 26, 2014). "Tax Breaks Encourage United Technologies To Stay In State." *Hartford Courant.* Retrieved from http://articles.courant.com/2014-02-26/business/hc-malloy-united-technologies-east-hartford-20140226_1_united-technologies-corp-utc-aerospace-systems-connecticut-home.

Feld, L.P., Kirchgassner, G., & Schaltegger, C.A. (July 2010). "Decentralized Taxation and the Size of Government: Evidence from Swiss State and Local Governments." *Southern Economic Journal,* 77. Retrieved from http://0-www.jstor.org.www.consuls.org/stable/27866754.

Felix, R.A. (Q2 2009). "Do State Corporate Income Taxes Reduce Wages?" *Economic Review, Federal Reserve Bank of Kansas City.* Retrieved from http://www.kc.frb.org/PUBLICAT/ECONREV/pdf/09q2felix.pdf.

Fox, W.F. & Luna, L. (September 2002). "State Corporate Tax Revenue Trends: Causes and Possible Solutions." *National Tax Journal,* 55.3. Retrieved from http://www.ntanet.org/NTJ/55/3/ntj-v55n03p491-508-state-corporate-tax-revenue.pdf.

Frank, R. (September 28, 2014). "Rise of Reno: Northern Nevada is booming. What can we learn from its growth?" *Las Vegas Sun.* Retrieved from http://www.lasvegassun.com/news/2014/sep/28/rise-reno-northern-nevada-booming-what-can-we-lear/.

Genschel, P. (June 2002). "Globalization, Tax Competition, and the Welfare State." *Politics and Society,* 30.2. Retrieved from http://0-pas.sagepub.com.www.consuls.org/cgi/content/long/30/2/245.

Larsen, B. (May 29, 2013). "2013 State Debt Medians Report." *Moody's Investors Service.* Retrieved from http://www.vermonttreasurer.gov/sites/treasurer/files/pdf/bonds/MoodysStateDebtMediansReport2013.pdf.

Kauffmann, M. & Keating, C. (February 18, 2015). "Governor's Budget: Cuts, Revenue Boosts, Lofty Goals." *Hartford Courant.* Retrieved from http://www.courant.com/politics/hc-budget-connecticut-gov-dannel-malloy-20150218-story.html#page=1.

National Conference of State Legislatures. (October 2010). "NCSL Fiscal Brief: State Balanced Budget Provisions." *National Conference of State Legislatures.* Retrieved from http://www.ncsl.org/documents/fiscal/StateBalancedBudgetProvisions2010.pdf.

Prillaman, S.A. & Meier, K.J. (April 2014). "Taxes, Incentives, and Economic Growth: Assessing the Impact of Pro-Business Taxes on U.S. State Economies." *The Journal of Politics,* 76. Retrieved from http://0-www.jstor.org.www.consuls.org/stable/10.1017/S0022381613001345.

Roe, M.J. (December 2009). "Delaware's Shrinking Half-Life." *Stanford Law Review*, 62. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=mfi&AN=47599508&site=eds-live.

Rosen, H.S. (2002). *Public Finance, Sixth Edition.* New York, New York: McGraw-Hill/Irwin.

Rossi, S. & Dafflon, B. (2004). "Tax competition between subnational governments: theoretical and regional policy issues with reference to Switzerland." *University of Fribourg.* Retrieved from http://www.unifr.ch/finpub/assets/files/test/Rossi_Dafflon_Taxcompetition.pdf.

Salop, S.C. (Spring 1979). "Monopolistic Competition with Outside Goods." *The Bell Journal of Economics*, 10.1. Retrieved from http://0-www.jstor.org.www.consuls.org/stable/3003323.

Seater, J.J. (March 1993). "Ricardian Equivalence." *Journal of Economic Literature*, 31.1. Retrieved from http://0-www.jstor.org.www.consuls.org/stable/2728152.

Shoenberg, S. (January 29, 2015). "Lawmakers look to state tax code, state funding to bring business to Western Massachusetts." *The Republican, Springfield, Massachusetts.* Retrieved from http://www.masslive.com/politics/index.ssf/2015/01/lawmakers_look_to_state_tax_co.html.

United States Census Bureau (2015). *State Government Finances* [Data File]. Retrieved from http://www2.census.gov/pub/outgoing/govs/special60/.

Wanniski, J. (Winter 1978). "Taxes, revenues, and the 'Laffer curve.'" *The Public Interest*, 50. Retrieved from http://www.nationalaffairs.com/doclib/20080528_197805001taxesrevenuesandthelaffercurvejudewanniski.pdf.

Wilson, J.D. & Wildasin, D.E. (2001). "Tax Competition: Bane or Boon." *University of Michigan: Office of Tax Policy Research.* Retrieved from http://www.bus.umich.edu/otpr/WP2001-11paper.pdf.